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Blast furnace gas compression

AIR Products South Africa recently designed and implemented a new way of mixing gases using thermo-compressor technology, and as part of ongoing trials has successfully commissioned the first station of its kind at ArcelorMittal's Newcastle operations.

Ian Gorin, Process Engineering Manager at Air Products South Africa, explains: "The problem was that the mill required a higher pressure gas than what was available from the blast furnace gas. Instead of the traditional method of using a booster compressor powered by electricity, we designed a gas thermo-compressor. This system controls and modulates the gas mix ratio to give exact calorific value as required by the customer.

"To compress the blast furnace gas by 25 kPa (according to the design flow rate) would have required a blower consuming 145 kW of power," Gorin continues. "The major benefit of the gas thermo-compressor is that it utilises zero electrical energy which obviously translates into significant cost savings for the customer."

The complete gas thermo-compressor station was designed by the Air Products South Africa projects team at the company's main facility in Vanderbijlpark. The team also jointly managed the installation with Air Products' Newcastle operations team.

"The need for the station arose from an energy deficit at ArcelorMittal," says Gorin. "The steel mill was importing a high calorific value methane-rich gas, while the blast furnace was flaring gas. The gas is combustible and usable if mixed in the correct proportion with methane-rich gas, to create a mixed gas with the correct calorific value."

The system works on the principle of using the higher pressure from the methane-rich gas as the motive gas to induce a flow of low pressure blast furnace gas – thereby creating a mixed gas at an intermediate pressure which is higher than the blast furnace gas.

By modulating the various pressures, the thermo-compressor produces the mixed gas at a set flow rate, and in the correct ratios of the gases as required by the steel mill.

According to Gorin, the concept would work well where there are integrated mills, such as a blast furnace which produces low calorific value gas, as well as a mill using higher calorific value gas.

"The concept of mixing gases using a thermo-compressor, and not an electrically-powered booster fan, is exclusive to Air Products. We are very proud of this ground-breaking innovation," says Rob Richardson, General Manager: On-Sites at Air Products South Africa.

"We are also proud of the fact that our first gas thermo-compressor station was commissioned on time, on budget and according to customer requirements."

While this concept is new to the South African market, it will also be rolled out internationally, and has important implications in terms of energy efficiency and cost-savings.

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